became dim, but would soon regain its former brilliancy. The observer states that, by holding up his hands, electric sparks would form on the ends of his fingers, and that his hair and clothing were full of them. A peculiar crackling noise was heard about the anemometer cups; and at the corners of the office building there were continuous sparks of bright light.

Fort Apache, Arizona, 3d.—The anemometer attachments were damaged by atmospheric electricity on this date.

Fort Stockton, Texas.—Telegraphic communication was interrupted by atmospheric electricity at this place on the 1st.

## OPTICAL PHENOMENA.

### SOLAR HALOS.

Solar halos have been observed in the various districts on the following dates:

*New England.*—1st, 10th, 12th, 14th, 15th.

*Middle Atlantic states.*—1st, 8th, 12th to 15th, 18th, 23d, 26th, 27th.

*Eastern Gulf.*—2d, 14th, 17th, 19th, 27th.

*Western Gulf.*—5th, 6th, 10th, 13th, 18th, 23d, 26th.

*Lower lakes.*—1st, 10th, 11th, 15th, 18th, 21st, 23d.

*Upper lakes.*—8th, 14th, 17th.

*Upper Mississippi valley.*—3d, 4th, 8th, 9th, 18th, 21st, 23d, 25th.

Solar halos were also reported from the following stations not included in the districts named above:

Oakwood and Poway, California, 7th, 22d; San Francisco, California, 9th, 24th, 26th, 31st; Augusta, Georgia, 13th; Jacksonville, Florida, 24th; Fort Scott, Kansas, 10th; Louisville, Kentucky, 3d; Sunman, Indiana, 8th; Saint Vincent, Minnesota, 28th; Nashville, Tennessee, 31st; DeSoto, Nebraska, 10th, 25th.

### LUNAR HALOS.

Lunar halos have been observed in the various districts on the following dates:

*Middle Atlantic states.*—8th, 12th, 13th, 16th, 18th, 19th, 20th.

*South Atlantic states.*—13th, 16th to 19th.

*Florida peninsula.*—9th, 10th, 11th, 16th, 21st.

*Eastern Gulf.*—16th, 21st, 23d.

*Western Gulf.*—6th, 10th, 12th to 18th, 21st.

*Lower lakes.*—12th, 14th, 17th.

*Upper lakes.*—2d, 11th, 13th, 14th, 19th, 20th.

*Upper Mississippi valley.*—1st, 11th, 13th, 14th.

*Missouri valley.*—10th, 17th, 19th.

Lunar halos were also reported from the following stations, not included in the districts named above:

Oakwood, California, 18th; Red Bluff, California, 24th; Fort Grant, Arizona, 9th; Indianapolis, Indiana, 21st; Laconia, Indiana, 14th; Portland and Cornish, Maine, 15th; Boston, Massachusetts, 14th; Knoxville, Tennessee, 22d; Memphis, Tennessee, 15th; Nashville, Tennessee, 10th; Fort Concho, Texas, 10th; Fort Stockton, Texas, 18th.

### MIRAGE.

Indianola, Texas, 9th.—During the middle part of the day, the court house and buildings in this city were plainly seen by people in the country, at a distance of from fifteen to sixteen miles. Mirage was also observed on the following dates: 15th, 17th, 18th, 19th, 23d, 31st.

## MISCELLANEOUS PHENOMENA.

### SUNSETS.

The characteristics of the sky, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from one hundred and forty-five stations show 4,462 observations to have been made, of which nine were reported doubtful; of the remainder, 4,453, there were 3,795, or 85.2 per cent., followed by the expected weather.

### SUN SPOTS.

The following record of sun spots for the month of August, 1883, has been forwarded by Professor D. P. Todd, Director of the Lawrence Observatory, Amherst, Massachusetts:

| Date—Aug., 1883. | No. of new | | Disappeared by solar rotation. | | Reappeared by solar rotation. | | Total No. visible. | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | Gr'ps | Spots | Gr'ps | Spots | Gr'ps | Spots | Gr'ps | Spots | |
| 1, 8 a. m. | 0 | 0 | 1 | 25‡ | 0 | 0 | 2 | 25‡ | Spots probably disappeared by solar rotation. |
| 3, 7 p. m. | 0 | 0 | 1 | 20‡ | 0 | 0 | 1 | 2 | Do. |
| 4, 8 a. m. | 1 | 4 | 0 | 0 | 1 | 4 | 2 | 6 | |
| 5, 10 a. m. | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 6 | |
| 6, 7 a. m. | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 5 | |
| 7, 8 a. m. | 2 | 6 | 1 | 1 | 1 | 3 | 3 | 10 | |
| 8, 8 a. m. | 2 | 20‡ | 0 | 0 | 1 | 10‡ | 4 | 30‡ | |
| 9, 6 a. m. | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 20‡ | Spots mostly very small. |
| 12, 9 a. m. | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 15‡ | Do. |
| 13, 8 a. m. | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 12‡ | |
| 14, 2 p. m. | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 7 | |
| 15, 7 a. m. | 1 | 2 | 0 | 0 | 1 | 2 | 3 | 9 | |
| 17, 8 a. m. | 3 | 7 | 0 | 0 | 3 | 7 | 6 | 13 | Spots probably reappeared by solar rotation. |
| 19, 12 m | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 10 | |
| 20, 8 a. m. | 1 | 2 | 1 | 2 | 1 | 2 | 4 | 8 | |
| 21, 11 a. m. | 0 | 2 | 0 | 0 | 0 | 2 | 3 | 9 | |
| 22, 3 p. m. | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 6 | |
| 24, 12 m | 2 | 6 | 0 | 0 | 0 | 0 | 4 | 12 | |
| 25, 11 a. m. | 1 | 10‡ | 1 | 1 | 0 | 0 | 4 | 20‡ | Broad areas of faculæ. |
| 26, 9 a. m. | 0 | 20‡ | 0 | 0 | 0 | 0 | 4 | 40‡ | Do. |
| 27, 8 a. m. | 1 | 4 | 1 | 4 | 0 | 0 | 4 | 40‡ | Do. |
| 28, 8 a. m. | 1 | 20‡ | 0 | 0 | 0 | 0 | 5 | 60‡ | |
| 29, 8 a. m. | 1 | 15‡ | 0 | 5 | 1 | 5 | 6 | 70‡ | |
| 30, 8 a. m. | 0 | 10‡ | 0 | 0 | 0 | 5 | 6 | 80‡ | |
| 31, 10 a. m. | 0 | 10‡ | 0 | 5 | 0 | 0 | 6 | 85‡ | |

Faculæ were seen at the time of every observation. ‡Approximated.

Mr. William Dawson, of Spiceland, Indiana, reports having observed sun spots during August, as follows:

4th.—Three groups, eight spots.

6th.—Two groups, seven spots.

7th.—Four groups, fourteen spots.

11th.—Five groups, twenty-three spots.

12th.—Five groups, thirty-three spots, mostly on the eastern hemisphere. A spot of moderate size, with fine penumbra, was observed in the southeastern quadrant.

18th.—Seven groups, twenty-one spots.

20th.—Four groups, seven spots.

22d.—Three groups, forty spots; one long scattering group toward the west side.

24th.—Six groups, thirty spots; one large spot in the southeastern quadrant.

27th.—Five groups, eighty-five spots; one large group in northwest quadrant, and one large spot in the southwest quadrant.

28th.—Five groups, eighty-five spots.

30th.—Six groups, one hundred and fifteen spots; one row of groups south of equator.

Mr. T. C. Hunter, at Wabash, Indiana, reports that a large number of sun spots were observed by him during August, the month closing with fourteen spots of good size still visible on the sun. They were seen on every clear day after the 10th.

Mr. H. D. Gowey, at North Lewisburg, Ohio, reports that sun spots were seen on all clear days during the month. They were most numerous on the 31st; least numerous on the 3d; smallest on the 4th, and largest on the 30th and 31st.

### METEORS.

Savannah, Perry county, Illinois.—On the 2d, at about 9 p. m., a large meteor passed southward along the "milky way" leaving a brilliant trail, from 30° to 40° in length. A few minutes after midnight of the 11th, four shooting stars were seen within ten minutes. On the 16th a very large meteor was seen in the southeastern sky, which exploded, and was followed by three loud detonations. On the evening of the 27th three meteors were seen within twenty minutes.

Cairo, Illinois.—A bright meteor, of yellowish color, leaving a trail 20° in length, was observed at 9.30 p. m. of the 4th. Another meteor, of similar appearance, was seen at 9.35 p. m., and between 9 and 10 p. m., of the same date, about twenty-five meteors were seen. Numerous meteors were also observed at this station on the evening of the 5th, between 8 and 10 p. m.

New London, Connecticut.—A large number of shooting

stars were observed at this place during the early morning of the 5th and during the night of the 5–6th. Those observed on the morning of the 5th, were most numerous in the northern sky between 1 a. m. and daybreak. During the following night they were most numerous in the west and northwest, but they were seen in all parts of the sky.

Vevay, Switzerland county, Indiana.—On the evening of the 8th thirty-six meteors were observed between 8.25 and 9.30 p. m.

Los Angeles, California.—At 12.40 a. m., of the 11th, a large and brilliant meteor was observed to pass from east to west, leaving a trail which remained visible for six seconds.

New York City.—At 7.30 p. m., of the 21st, a bright meteor was observed, which exploded with a loud report when near Bedloe's Island.

Leetsdale, Allegheny county, Pennsylvania.—At 9.50 p. m., of the 23d, a brilliant meteor was observed in the northeastern sky. It first appeared about 55° above the horizon, and, passing diagonally across the sky, disappeared at an elevation of 15°, leaving a luminous trail.

Boston, Massachusetts.—Six meteors were observed within fifteen minutes on the evening of the 24th.

Meteors of less brilliancy are reported to have been seen during the month, as follows:

Yuma, Arizona, 8th, 11th.
Lead Hill, Arkansas, 16th.
Bethel, Connecticut, 7th to 11th.
Limona, Florida, 10th, 18th.
Swanwick, Illinois, 2d, 11th, 16th, 27th.
Davenport, Iowa, 2d, 3d, 5th, 6th, 7th, 10th, 23d, 24th, 31st.
Manchester, Iowa, 10th, 19th.
Fort Scott, Kansas, 2d, 5th, 8th, 29th.
Point Pleasant, Louisiana, 6th, 8th.
Woodstock, Maryland, 1st, 4th, 6th, 22d, 26th, 27th, 28th, 31st.
Charlestown, Massachusetts, 3d.
Fall River, Massachusetts, 10th, 25th, 26th.
Milton, Massachusetts, 21st.
Somerset, Massachusetts, 7th, 25th, 31st.
Provincetown, Massachusetts, 9th, 10th.
Taunton, Massachusetts, 3d, 22d.
Lansing, Michigan, 1st.
Northfield, Minnesota, 4th, 8th, 22d, 25th.
Saint Vincent, Minnesota, 25th.
Freehold, New Jersey, 3d.
Moorestown and Vineland, New Jersey, 6th.
Menand Station, (near Albany,) New York, 4th, 5th, 11th, 26th.
Brevard, North Carolina, 3d.
Erie, Pennsylvania, 26th.
Stateburg, South Carolina, 9th, 11th, 19th, 24th, 31st.
Woodstock, Vermont, 12th.
Variety Mills, Virginia, 6th, 22d, 26th.
Wytheville, Virginia, 4th.
Marion, Virginia, 1st.
Ripon, Wisconsin, 3d, 22d, 24th.

### EARTHQUAKES.

Oakland, California.—Two light shocks of earthquake were felt at this place on the 4th; the first shock occurring at 11 a. m., and the second at 12.50 p. m. The course of the vibrations was from east to west.

Carson City, Nevada.—At 2.55 a. m., of the 19th, three slight shocks of earthquake were felt at this place.

London, August 14th.—A despatch from Serajevo, capital of Bosnia, announces that a shock of earthquake has been felt there. It lasted five seconds, and moved from west to east.

Washington, District of Columbia, August 23d.—Surgeon Main, at Brownsville, Texas, in a report to the Surgeon General of the Marine Hospital Service, says: "early in August there was an earthquake shock at Pachuca, Mexico, causing twenty deaths and the destruction of twenty houses.

Naples, Italy, August 22d.—Mount Vesuvius is in a state of remarkable activity. The continuous trembling of the earth has resulted in considerable injury to buildings and to the railway running up the mountain.

Saint Thomas, West Indies, September 4th.—A tidal wave occurred here on August 27th; the water receded from the shore three times. A sharp shock of earthquake was felt at 10 o'clock on the following night. On August 30th two shocks were felt almost simultaneously; the first being light but the second was severe. Considerable alarm was caused but no damage was done.

Guayaquil, Ecuador, August 30th.—A strong shock of earthquake was felt here at 8 o'clock, lasting about fifteen seconds.

Captain Luders of the bark "Pallas" which arrived at New York, September 4th, reports that, on May 21st, while in the Bay of Sunda, ashes from a volcanic eruption began falling and covered the decks to a depth of more than four inches. The ashes continued to fall until the 26th, when the vessel was from five hundred to six hundred miles from Java. During part of the time darkness prevailed day and night, compelling the use of the binnacle lamp.

Concerning the volcanic disturbances, which caused such wide-spread destruction of life and property in the Island of Java, during the latter part of August, the following notes are taken from the report published in the "New York Herald," of September 2d, 1883:

"The disturbances began on Saturday, August 25th, on the Island of Krakatoa, which is situated at the neck of the strait of Sunda, between Sumatra and Java. The deep rumblings were distinctly audible at Surakerta and Batavia, about forty-five and twenty-two miles distant, respectively. At Jogjakerta, Sourabaya, and Samarang, red hot rocks and ashes fell throughout the night of August 25th, and at Batavia there was an occasional fall of heated stones and ashes. By the following morning all communication with Anjer, a town on the strait of Sunda, was cut off, all the bridges having been destroyed by the descending rocks and ashes. The disturbance had extended beneath the waters of the strait, which were soon boiling and hissing violently, while great waves dashed upon the Javanese shores, and the temperature of the sea rose nearly 20°. The rumbling gradually became more and more distant, and by noon the largest of the volcanoes of Java was in violent eruption, which gradually spread to the other mountains, until more than one-third of the forty-five craters of Java were either in active eruption or were threatening it.

"Just before dusk a great luminous cloud formed over the Gunung Gunter (a crater of more than four miles in diameter) when it began to emit enormous streams of white acid, sulphurous mud, and smaller quantities of lava. There were rapidly succeeding explosions, followed by heavy showers of cinders and large fragments of rock, which were hurled into the air and scattered in all directions. During the evening the shocks and eruptions increased, and enormous waves began to dash with great force upon the shores, which came in some places far into the interior, and great chasms opened in the earth. About midnight a large luminous cloud, similar to that which was seen over the Gunung Gunter, but of much greater extent, formed over the Kandang range of mountains. This cloud gradually increased in size, forming a canopy of lurid red and whitish gray colors over a wide extent of territory. The eruptions now increased and streams of lava poured down the sides of the mountains into the valleys, sweeping everything before them. At about 2 o'clock Monday morning the great cloud suddenly broke into small sections and vanished. When daybreak came it was seen that an extent of territory about fifty miles square had disappeared, on which were situated several villages. None of the inhabitants of this region escaped death, the number being estimated at about 15,000.

"On Monday night the volcano of Papandayang, which is more than 7,000 feet high, was in a very active state of eruption, which was accompanied by loud detonations. Stones fell for miles around, and the black fragmentary matter, which was

carried into the air, caused total darkness. A whirlwind accompanied this eruption, which unroofed houses, blew down trees, and carried men and animals into the air. Suddenly the mountain was split into seven parts, and from the fissures poured clouds of steam. One of the most singular incidents was the sudden rising, on the forenoon of Tuesday, of fourteen new volcanic mountains in the straits of Sunda, almost on the top of what had been the Merak and Middle islands, which sank into the sea on the previous day. At the entrance of Batavia was a large group of houses extending along the shore. These were entirely swept away, and of the 25,000 Chinese inhabitants who lived on the swampy plains, not more than 5,000 escaped death. Sunda strait is much changed, and navigation in these waters is accompanied with great risk. It is estimated that on the whole island there were not less than 75,000 lives lost."

The following report was made to the superintendent of the United States Coast and Geodetic Survey by Professor George Davidson, Assistant Superintendent at San Francisco:

"San Francisco, California, August 29th, 1883. Earthquake waves commenced on Saucelito tide gauge at one o'clock on the morning of August 27th. They had increased in height, and were still exhibited yesterday. Height of waves one-foot, and time about forty minutes between crests.

"It is supposed that these waves were caused by the earthquake that destroyed Anjer and other towns in Java on August 27th. There was a similar occurrence on December 23d, 1854, when the town of Simoda, in Japan, was destroyed, and a Russian frigate in the harbor overwhelmed. The waves were recorded on the three coast survey tide gauges then used on the Pacific coast. Disturbances of like character were also recorded on these guages in August, 1868, when a succession of terrible earthquake waves broke upon the coast of Peru, destroying towns and landing a United States war vessel high and dry. The rate at which such waves move across the ocean, and also the average depth of the ocean, may be computed from such tide gauge records."

## DROUGHT.

*Arkansas.*—Little Rock, 29th: the crops in this locality are suffering for want of rain.

*Indiana.*—Laconia, Harrison county, 31st: the most severe drought that has been experienced since 1874 is prevailing in this locality.

*Louisiana.*—Shreveport, 31st: the month of August has been exceedingly dry; owing to the prolonged drought it is considered that the cotton crop in this part of the state will not be more than half the average yield.

*Maine.*—Bangor, Penobscot county, 23d: the severe drought is causing injury to the crops in this locality.

Portland, 31st: drought has been prevailing in eastern New England from five to six weeks. Crops and pasturage have been seriously injured; in some instances farmers have been compelled to feed their stock with winter provender, owing to poor condition of pastures.

*Massachusetts.*—Somerset, Bristol county, 31st: only 0.83 inch of rain fell during the month, and a severe drought is prevailing in consequence.

*Mississippi.*—Vicksburg, 28th: vegetables in this locality are suffering from lack of rain.

*South Carolina.*—Drought in this state has been general, and the outlook for an average yield of crops is not promising. It is considered that the general average yield of corn and cotton in this state will be about three-fourths of the usual crop. Reports from several counties are given below:

Pickens, Pickens county, 30th: the condition of crops in this county is very poor; not more than half the average yield of corn and cotton will be produced.

Georgetown, Georgetown county: the crops in this county are suffering from drought, and unless soon relieved will be considerably cut off.

Yorkville, York county, 20th: drought has prevailed in the greater part of this county, but it has not been so protracted as the drought of 1881. In some parts of the county the crops are good, but they are exceptional instances; it is estimated that there will not be more than half of the usual crop of cotton, and the corn crop will be below that estimate.

Darlington, Darlington county, 29th: the crops in this county have suffered severely from the long drought. Not more than two-thirds of the average crop of cotton, and one-half of the average corn crop will be made.

*Texas.*—Indianola, 20th: the drought continues to prevail in this part of the state. The cotton crop is estimated to be thirty-three per cent. less than for 1882, and the corn crop is nearly a complete failure. Cisterns are low, and scarcity of water exists. In some localities cattle are dying in consequence of poor pasturage and scarcity of water.

Galveston, 17th: owing to the prolonged drought there is great scarcity of water in this city and adjacent country. Cisterns have become exhausted, and the gardens are dried up.

*Virginia.*—Lynchburg: the long continued drought has resulted in serious damage to the corn crop in this part of the state.

*Washington Territory.*—Bainbridge Island, Kilsap county: the month of August has been the dryest known in this part of the territory during the last six years.

## PRAIRIE AND FOREST FIRES.

The prevalence of extensive forest fires in Oregon and Washington Territory during July, and their continuation there and in portions of Idaho and Montana during August, caused a dense smoke to spread over a large area of country. This densely smoky and hazy condition of the atmosphere prevailed during a greater part of the month, and extended over an area as far southward on the Pacific coast as Cape Mendocino, California, and thence eastward to eastern Montana, Dakota, and Minnesota.

Duluth, Minnesota, 25th.—Serious forest fires are raging in the pine lands on the opposite side of Lake Superior.

Portland, Maine, 31st.—Forest fires in adjacent country, and the atmosphere is filled with smoke.

Portland, Oregon, 31st.—Dense smoke from forest fires has continued during the entire month.

Mount Washington, New Hampshire, forest fires in northeast, 29th.

Bainbridge Island, Washington Territory, 31st.—Destructive forest fires have been raging in this territory since May 18th.

Cœur d'Alene, Idaho, 8th.
Fort Lapwai, Idaho, 4th.
Fort Maginnis, Montana, 6th, 14th, 24th, 26th, 29th.
Fort Benton, Montana, 6th.
Fort Concho, Texas, 5th, 6th, 9th.
Fort Stockton, Texas, 21st, 28th.
Coleman City, Texas, 16th, 29th, 30th.
Spokane Falls, Washington Territory, 1st.

## POLAR BANDS.

Polar bands have been observed as follows:

Lead Hill, Arkansas, 1st, 4th, 6th, 7th, 8th, 10th, 15th, 22d, 24th, 27th, 31st.
Cape Mendocino, California, 25th.
Riley, Illinois, 1st.
Springfield, Illinois, 27th.
Clear Creek, Nebraska, 3d, 4th, 19th.
Vineland, New Jersey, 7th, 8th, 9th, 23d.
Charleston, South Carolina, 28th.
Woodstock, Vermont, 28th.
Wytheville, Virginia, 5th, 9th, 19th.

## WATER-SPOUTS.

The s. s. "Germanic," on August 6th, at about 8 p. m., (Greenwich mean time,) in about N. 40° 47′, W. 62° 20′, passed two water-spouts of medium size about three miles north of the ship. The weather at that time was sultry; wind wsw., force 3; sky about one-fourth cloudy. They remained visible for about eighteen minutes.

Galveston, Texas.—At 9 a. m., of the 31st, an imperfectly formed water-spout was observed over Galveston bay, moving in a northwesterly direction. At 9.15 a. m. a well defined water-spout was observed in the east over the Gulf. These water-spouts were of a leaden hue, and lasted about one-half hour.

MIGRATION OF BIRDS.

*Geese flying southward.*—Keokuk, Iowa, 22d; Portland, Oregon, 29th; LaCrosse, Wisconsin, 30th. *Flying northward.*—Cape Mendocino, California, 26th, 27th.

*Ducks flying northward.*—Bangor, Maine, 29th.

ZODIACAL LIGHT.

Pensacola, Florida, 1st, 2d, 3d.
Nashville, Tennessee, 3d, 31st.
Palestine, Texas, 1st, 2d, 14th, 16th, 18th, 27th, 29th, 30th.

SAND STORMS.

Fort Yates, Dakota, 18th, 19th, 21st.

NOTES AND EXTRACTS.

An interesting report upon the climate of Palestine, by Mr. Selah Merrill, United States consul at Jerusalem, has been received at this office through the Honorable Secretaries of State and War. It is regretted that sufficient space in the MONTHLY WEATHER REVIEW cannot be spared for the publication of the full report as prepared by Mr. Merrill. For this reason, eight tables, containing interesting miscellaneous data covering a period of twenty-two years, are not published. The letter of Mr. Merrill, transmitting this report to the Department of State, was written at the United States consulate, in Jerusalem, July 11, 1883. The following extract from the report referred to will be found of interest:

*Seasons in Palestine.*—There are in Palestine two seasons, a rainy season and a dry one. The shortest rainy season in twenty-two years has been one hundred and twenty-six days, and the longest two hundred and twenty-one days, while the mean duration of each has been one hundred and eighty-eight days. On the other hand, the shortest dry season for the same period was one hundred and thirty-four days and the longest two hundred and eleven days, while the mean duration of each was one hundred and seventy-seven days.

*Commencement of the rain.*—The time of the commencement of the rain is uncertain, and varies many weeks between the two extremes. In September the people of the country begin to talk about rain and to look for the tokens of it, but rain very seldom falls during that month, and further, that in eleven of the twenty-two years under consideration, no rain fell even in October. When rain does not fall until the middle or the last of November great anxiety and distress are caused by the delay. In four of the twenty-two years there was a slight fall of rain in September, but rain during this month is to be considered as exceptional.

*The "early," "middle," and "latter" rains.*—Every one is familiar with the terms, the "early" and the "latter" rains, which refer to parts of the rainy season. The rainy season, however, is really divided into three parts, and it is during the middle one of these periods that the most rain falls. It is very seldom that many days of rainy weather occur in succession, but whether the rainy periods are of one or of several days duration, they are sure to be followed by one or many days of fine weather, and these fine days of the winter and early spring months are some of the most enjoyable that the climate of Palestine affords. The "early" rains are depended upon to moisten the earth and fit it for the reception of seed, and hence it is a general signal for the commencement of plowing. The middle or heavy winter rains furnish the real water supply of the year. The earth is then saturated, springs are replenished, and cisterns are filled with water. The "latter" rain, which falls in gentle showers, is indispensable to the perfection of the grain. However copious may have been the winter rains, unless the "latter" rain falls, the harvest is wholly or in part a failure. Hence, this is looked for by the farmers especially, and by all the people of the land as well, with peculiar anxiety.

*Connection of wind with rain.*—Most of the rain storms come from a westerly direction. Of those noted during the period of twenty-two years, forty-nine were from the northwest; one hundred and fifty-six were from the west; and two hundred and thirty-eight were from the southwest. On one hundred and forty-nine occasions, however, an easterly wind immediately preceded the change which ushered in the rain. Not infrequently the direction of the wind changes during the storm; if it passes to the north the rain ceases; while a change from any quarter to the southwest usually indicates a continuance of the rain.

*Temperature during rainfall.*—On three hundred and sixty-nine occasions the temperature of the air became lower as the rain fell; on ninety occasions it rose slightly; and on forty-seven occasions it remained stationary, or nearly so, until the rain ceased.

*Snow.*—During twenty-two years eight seasons have passed without snow, against fourteen seasons, when snow has fallen. In general, snow falls in small quantities and soon melts, but occasionally there is a heavy fall, that, for instance, for the 28th and 29th of December, 1879, which was extremely heavy, measuring seventeen inches on a level.

*Earthquakes.*—Most of the earthquakes that have been noted occurred during the rainy seasons. Eight occurred during actual storms, and four of these occurred during snow storms. It is interesting to observe further that, in nearly every instance, they had been preceded or were followed by an easterly wind.

*Barometer.*—Jerusalem is 2,600 feet above the level of the Mediterranean, and the mean height of the barometer during twenty-one years has been 27.398 inches. The highest reading during this period was 27.816 inches on the 31st of December, 1879; the lowest was 26.972 inches on the 22d of April, 1863, and on the 3d of February, 1865; so that the extreme range has been 0.626 inch.

*Cold, heat, and frost.*—The coldest month in Jerusalem is February, in which month the mean temperature during the last twenty-two years has been 47°.9 (Fahr.) It rises, month by month, until August, when the mean temperature has been 76°.1 (Fahr.), and then sinks again, month by month, until the following February. The mean annual temperature during this period was 62°.8 (Fahr.). The hottest days of the year do not occur, however, in August, but usually in the months of May, June, and September. The lowest temperature registered by the thermometer during this period was 25° (Fahr.), which was on the 20th of January, 1864. In February and October, also, and once in April, a minimum of 32° and 30° has been noted. These cases are, however, notably exceptional.

In Jerusalem frost occurs on five or six nights in the course of a winter, but ice is rarely ever formed.

*Winds.*—A peculiar feature of the climate of Palestine is its strong winds. The physical conformation of the country has doubtless something to do with this. There is a ridge of rugged mountains running north and south which drops to a broad maritime plain on the west, and on the east to a deep chasm, sunk into the earth to a depth of 1,300 feet below the level of the Mediterranean, beyond which chasm (which is the Jordan valley) another ridge of mountains rises abruptly to a height equal to, or greater than, that of the western ridge, and beyond this, in turn, a vast table land stretches eastward to the Euphrates and southward to Arabia.

Both the inhabitants of the country and its crops are largely affected by the prevailing winds. The north wind is cold; the south warm; the east dry; and the west is moist. North and northwesterly winds prevail most in the summer months, when they are cool and refreshing, moderately dry and accompanied by few or no clouds. The north winds of winter are cold and sharp. Their coolness and sharpness, even in summer, are apt to produce sore throat, fever, and dysentery. Without the strong westerly winds of summer the climate of Jerusalem would be unbearable. Occasionally these winds do not blow for several days in succession, and at such times the heat becomes very great. As a rule this strong westerly breeze comes up every afternoon. It is felt at Jaffa, and at other places on the coast, as early as 9 or 10 a. m., but it does not reach Jerusalem until 2 to 4 p. m. Generally it subsides about sunset, but rises again later in the evening and sometimes continues through a great part of the night. Consequently, however hot the day may have been in Jerusalem, the nights during the summer season are almost always cool. Thus this wind, although often strong, disagreeable, and filling the air with clouds of dust, is a great blessing to the inhabitants; but at the same time it makes it very necessary for them to take precautions to protect themselves from its influence at night. Easterly winds are rare in summer, while they are common in each of the other seasons. The average for sixteen years has been three days of easterly winds for each month from June to September, and eleven days for each month from October to May, inclusive.

*East wind and sirocco.*—The east wind in winter is usually accompanied by a clear blue sky, and is dry, stimulating, and, if not too strong, is very agreeable. In the warmer months it is unpleasant and depressing from its great heat and dryness, and the haze and dust which ocassionally accompany it. The southeast winds are those which are popularly termed siroccos, and which are most disagreeable. "The worst kind of sirocco," says Dr. Chaplin, "dries the mucous membrane of the air passages producing a kind of inflammation resulting in catarrh and sore throat; it induces great lassitude, incapacitating for mental as well as bodily exertion, in those who work in it; headache, with a sense of constriction as if a cord were tied around the temples, oppression of the chest, burning of the palms of the hands and soles of the feet, accelerated pulse, thirst and sometimes actual fever. It dries and cracks furniture, loosening the joints of tables and chairs, curls the covers of books and pictures hung in frames, parches vegetation, and sometimes withers whole fields of young grain. Its force is not usually great, but sometimes severe storms of wind and fine dust are experienced, the hot air burning like a blast from an oven, and the sand cutting the face of the traveller who has the misfortune to encounter it. This kind of air has a peculiar smell, not unlike that of the neighborhood of a burning brick kiln. Sometimes the most remarkable whirlwinds are produced, especially in the western plain near the hills, by the meeting of a strong east or southeast wind with a wind from the west or north. Clouds of sand fly about in all directions, now taking the traveller in front, now behind, and now on the side, and the gusts of wind are so violent as to blow weak persons from their horses, and to overturn baggage animals. The cold sirocco of winter often blows with much force, and when it comes from a few degrees north of east it is so cold and